ISSN 1364–7565 Acta Phytotax. Geobot. 55 (1): 1–8 (2004)

Two New Species of *Vincetoxicum* (Apocynaceae-Asclepiadoideae) from Japan

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Two new species, *Vincetoxicum izuense* and *V. hoyoense,* are described here. *Vincetoxicum izuense* is a twining perennial herb on rocky beaches and on the margins of thickets near the sea and is endemic to the southern Izu Peninsula. It resembles *V. sublanceolatum* and *V. japonicum,* but *V. izuense* is distinguished from them by the leaves, follicles and trichomes on the lower surface of the leaves. *Vincetoxicum hoyoense* is a large, perennial, twining herb on rocks and on the margins of thickets facing the sea and is endemic to the area around the Bungo Channel. *Vincetoxicum hoyoense* resembles *V. japonicum* f. *puncticulatum* and *V. sublanceolatum,* but *V. hoyoense* can be distinguished from them by the larger, elliptic or ovate leaf blades with shallowly cordate base and the longer corolla lobes. Although *V. hoyoense* also resembles *V. izuense* in flower, morphology and leaf shape, *V. hoyoense* is easily distinguished from it by the large ovate or elliptic leaves with shallowly cordate base and the large corollas.

Key words: Bungo Channel, Izu Peninsula, new species, *Vincetoxicum*

The genus *Vincetoxicum* Wolf comprises approximately 100 species distributed in the Old World. The center of diversity is in the Asian mountains and most of the species occur in China and Japan (Liede 1996). The morphological diagnostic characters of *Vincetoxicum* are the erect or twining stems, fascicled roots, membranaceous or chartaceous leaves, rotate corolla, and five fleshy staminal corona lobes. The lobes are separate or partly connected by much thinner interstaminal tissue (Liede 1996). Seventeen species of *Vincetoxicum* have been recorded from Japan, although Yamazaki (1993) treated these species under three section of the genus *Cynanchum*: sect. *Patellaria* T. Yamaz., sect. *Pycnostelma* (Bunge ex Decne.) T. Yamaz. and sect. *Vincetoxicum* (Wolf) Tsiang & P. T. Li. During our revision of Japanese *Vincetoxicum,* we found two undescribed species, *V. izuense* and *V. hoyoense,* and describe them here.

Vincetoxicum izuense T. Yamashiro, **sp. nov.,** Figs. 1A, B & 2

Haec species *V. japonico* et *V. sublanceolato* affinis, sed a priore caulibus volubilibus, laminis foliorum subtus dense pilosis, rachidibus inflorescentiarum brevioribus, et a posteriore laminis foliorum ellipticis (in illo lanceolatis vel angusti-trian-

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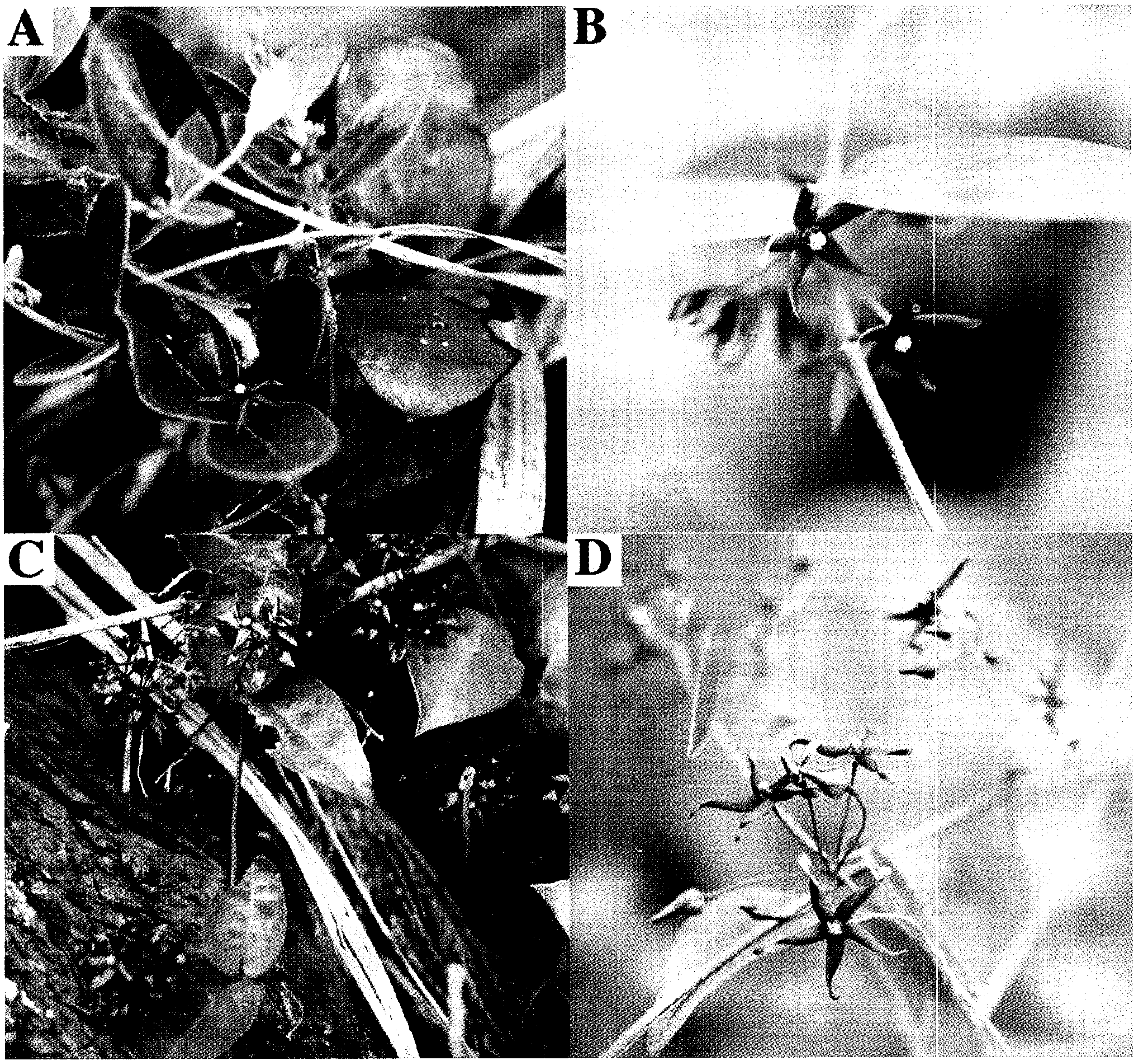

FIG. 1. Flowering plants of *Vincetoxicum izuense* (A, B) and *V. hoyoense* (C, D). Photographs from holotype (A, B for *T. Yamashiro 7435* and C, D for *T. Yamashiro & A. Yamashiro 7447*, respectively).

gularlibus), folliculis latioribus differt.

Type: JAPAN. Shizuoka Pref., Shimoda-shi, Mihogasaki, rocky beach, 20 Jul. 2000 (fl.), *T. Yamashiro 7435,* (holotype TUS; isotype TI).

Herbs, perennial, twining. Roots fascicled. Rhizome short, erect. Stem slender, terete, 0.7-1.5 mm in diam., 0.5-1 m long, lower part densely pubescent with curved trichomes, upper part puberulent in two lines. Leaves opposite; blade chartaceous, elliptic, oblong or ovate-oblong, 2.4-5.1 cm long, 1.1-3.1 cm wide, base rounded, margin and nerves on upper surface pubescent, densely pubescent on lower surface, apex acute or rounded, shortly apiculate; petiole 2-5.7 mm long, upper surface grooved, both surfaces densely covered with curved trichomes. Inflorescences axillary, umbellate-cymose, flowers 4 or 5; peduncle 1.2-5.4 mm long or inflorescences sessile toward apical part of stem, densely covered with curved trichomes; pedicel slender, 3.5-6 mm long, puberulent. Flowers: calyx rotate, lobes 5, lanceolate, 2 mm long, 1 mm wide, abaxially puberulent, apex acute; corolla rotate, dark purplish, 12 mm across, deeply 5 lobed, lobes lanceolate, 5 mm long, 1.9-2.2 mm wide, glabrous on both surfaces, apex retuse; corona 1/2 as long as gynostegium, dark purplish, deeply 5 lobed, lobes adnate to abaxial surface of filaments, triangular, apex obtuse, ca.1 mm long, 1 mm wide, fleshy; stamens 1.8 mm long; anther wings ca. 0.5 mm long; connective appendage membranaceous, depressed ovate, 0.3 mm long, 0.7 mm wide. Pollinarium: corpusculum narrowly-ellipsoid, 0.2 mm long, 0.06 mm wide; caudicules 0.12 mm long, filiform; pollinia ellipsoid, 0.28 mm long, 0.15 mm wide. Follicles fusiform, 4.5 cm long, 1 cm wide, glabrous. Seeds flat, ovate, 6.5-7.2 mm long, 4 mm wide, blackish brown, black speckled, coma ca. 2 cm long. Chromosome number $2n=22$ (Fig. 4A).

Japanese name: Izu-kamomezuru (nov.)

Vincetoxicum izuense is a perennial herb of rocky beaches and margins of thickets near the sea and is endemic to the southern Izu Peninsula (Fig. 5). In floral morphology it closely resembles *V. sublanceolatum* of the Tohoku to Kinki districts of Japan (Yamazaki 1993). *Vincetoxicum izuense* had been considered to be a maritime ecotype of *V. sublanceolatum* (Biological Laboratory Imperial Household 1980). From our field and morphological investigations, we found ecological and morphological differences between them. *Vincetoxicum sublanceolatum* grows in wet places, such as paddy fields, marshes and banks of rivers, whereas *V. izuense* occurs on rocky beaches. The leaf blades of *V. sublanceolatum* are lanceolate, linear-lanceolate or narrowly triangular and membranaceous; those of *V. izuense* are elliptic and chartaceous. The chromosome number of *V. sublanceolatum* has been reported as $2n = 44$ (Yamashiro *et al.* 2002). We counted $2n=22$ chromosomes in plants of *V. izuense* collected at Mihogasaki, Shimoda-shi, Shizuoka Prefecture (Fig. 4A), thereby showing that *V. izuense* is also distinguished from *V. sublanceolatum* cytologically.

Vincetoxicum izuense also resembles *V. japonicum,* which ranges from the Tohoku region to Kyushu (Yamazaki 1993), in its elliptical leaves and habitat. Both species inhabit rocky beaches and meadows near the sea and sometimes co-occur. *Vincetoxicum izuense* is easily distinguished from *V. japonicum* by its twining habit and the dense, curved trichomes on the lower surface of the leaves.

Other specimens examined: JAPAN. Honshu. Shizuoka Pref.: Shimoda-shi; Suzaki, 21 Jul. 1974, *J. Murata 31* (KYO); Goyotei, Maruyama, 21 Jun. 1979, *H. Hara s. n.* (TI); Ebisu Isl., anno 1964, *N. Tanaka s. n.* (KAG); Kakizaki, Nadegahara, 4 Aug. 1982, *T. Sato 2066* (TNS). Kamo-gun, Minamiizu-cho, Nakagi-Sashida, 22 Jun. 1958, *H. Noguchi 5970* (KAG); Hagachi, 13 Jul. 1957, *H. Noguchi 4539* (KAG).

Vincetoxicum hoyoense T. Yamashiro, **sp. nov.,** Figs. 1C, D & 3

Haec species *V. japonico* et *V. sublanceolato* affinis, sed a priore caulibus volubilibus, foliis et floribus majoribus; et a posteriore foliis ellipticis, ovatis vel oblongis (in illo lanceolatis vel anguste-triangularibus), folliculis latioribus differt.

Type: JAPAN. Oita Pref.: Minamiamabe-gun, Tsurumi-cho, Kajiyoseura, rocky beach, 8 Jun 2000, *T. Yamashiro & A. Yamashiro 7447* (holotype TUS; isotypes KYO, TI, TNS).

Herbs, perennial, twining, to 2 m long. Roots fascicled. Rhizome short, erect. Stems terete, 1-2.5 mm in diam., sparsely pubescent with short curved trichomes in one or two lines when young, later glabrescent, many-branched. Leaves opposite; petiole 0.8-2.2 cm long, both surfaces pubescent with short curved trichomes, upper surface grooved; blade on main stem chartaceous, elliptic, ovate or oblong, 9-13.5 cm long, 5-7.5 cm wide, nerves 5-7 reddish, pubescent on nerves on both surfaces, more or less densely so on lower surface, base shallowly cordate, margin ciliate, apex acuminate. Leaves on lateral shoots 1/2-1/3 as long as those of main stem; petiole 5-8 mm long; blade chartaceous, narrowly ovate or oblong, 3-6 cm long, 1.3-2.5 cm wide,

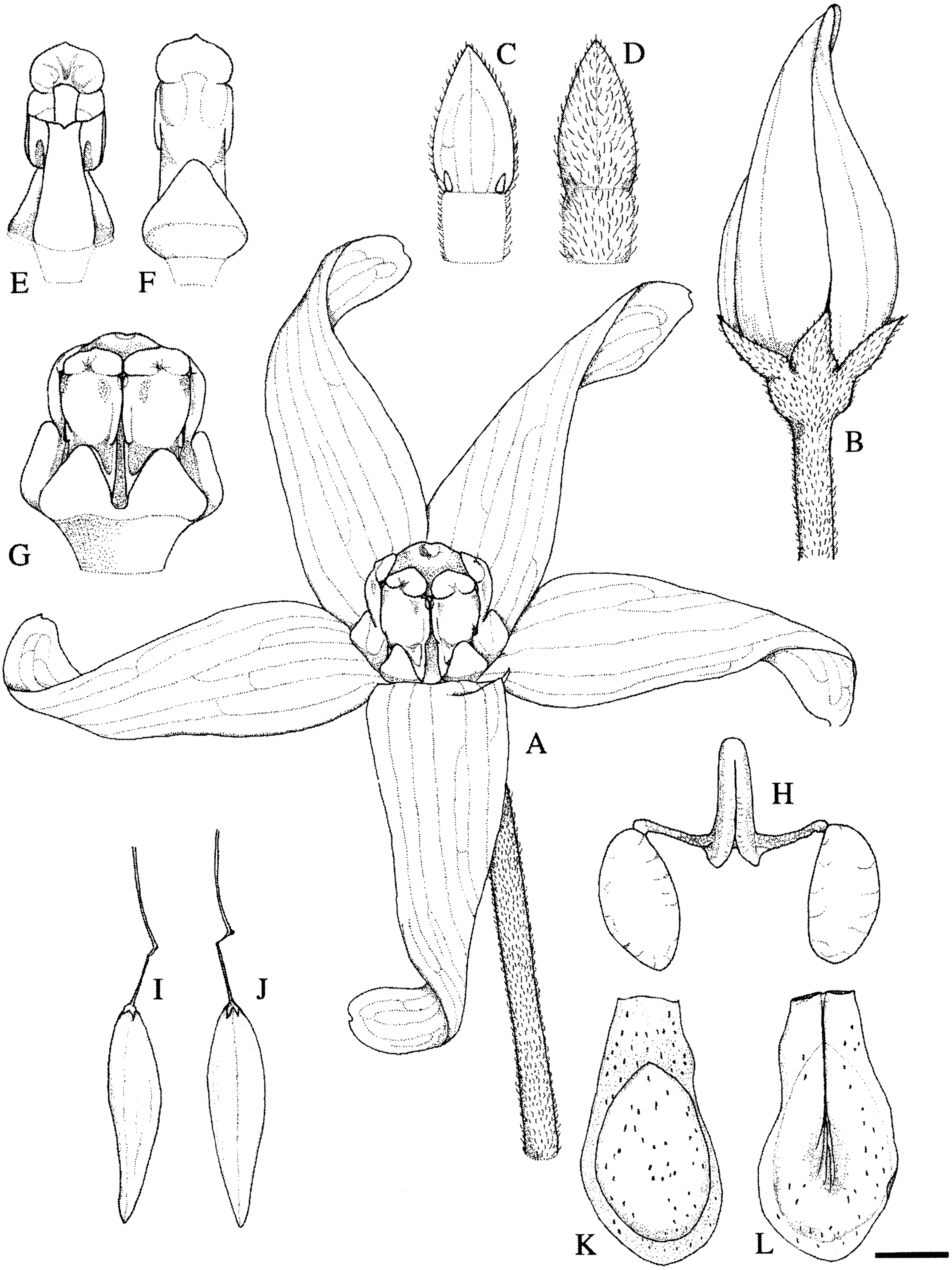

FIG. 2. Flower of *Vincetoxicum izuense.* A: whole flower. B: bud. C: adaxial view of calyx lobe D: abaxial view of calyx lobe. E: adaxial view of stamen. F: abaxial view of stamen. G: corona and gynostegium. H: pollinarium. I: lateral view of follicle. J: adaxial view of follicle. K: dorsal view of seed, coma removed. L: ventral view of seed, coma removed. Scale bar represents 1 mm for A-D, 0.5 mm for G-F, 0.15 mm for H, 1.5 cm for I, J and 2 mm for K, L. All figures were drawn from the holotype (*T. Yamashiro 7435*).

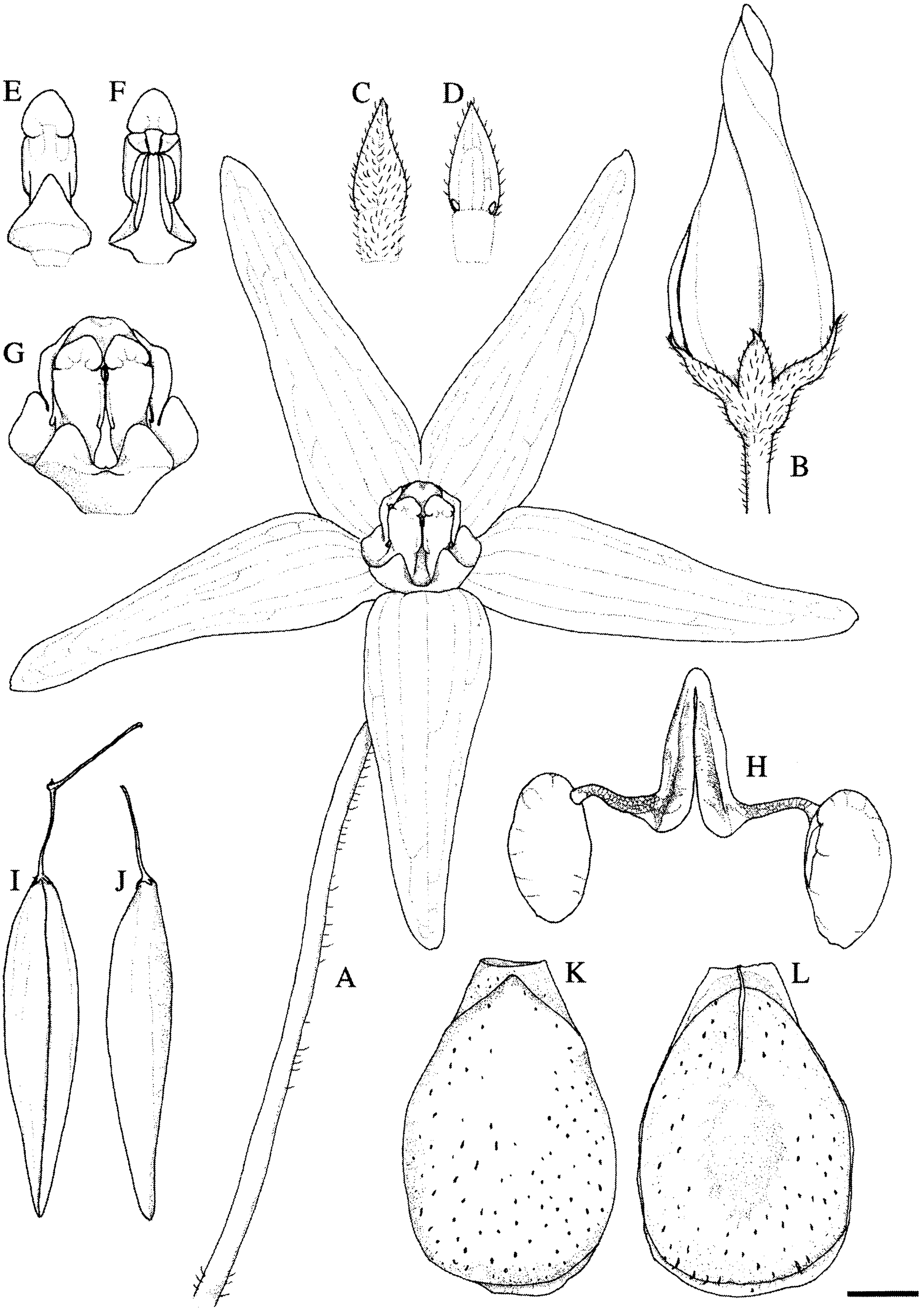

FIG. 3. Flower of *Vincetoxicum hoyoense.* A: whole flower. B: bud. C: abaxial view of calyx lobe D: adaxial view of calyx lobe. E: abaxial view of stamen. F: adaxial view of stamen. G: corona and gynostegium. H: pollinarium. I: adaxial view of follicle. J: lateral view of follicle. K: dorsal view of seed, coma removed. L: ventral view of seed, coma removed. Scale bar represents 1.5 mm for A, B, 1.25 mm for C, D, 1 mm for G-F, 0.15 mm for H, 1.5 cm for I, J and 2 mm for K, L. Voucher specimens. A-H: holotype (*T. Yamashiro & A. Yamashiro 7447*). J-L: T. *Yamashiro & A. Yamashiro 7798.*

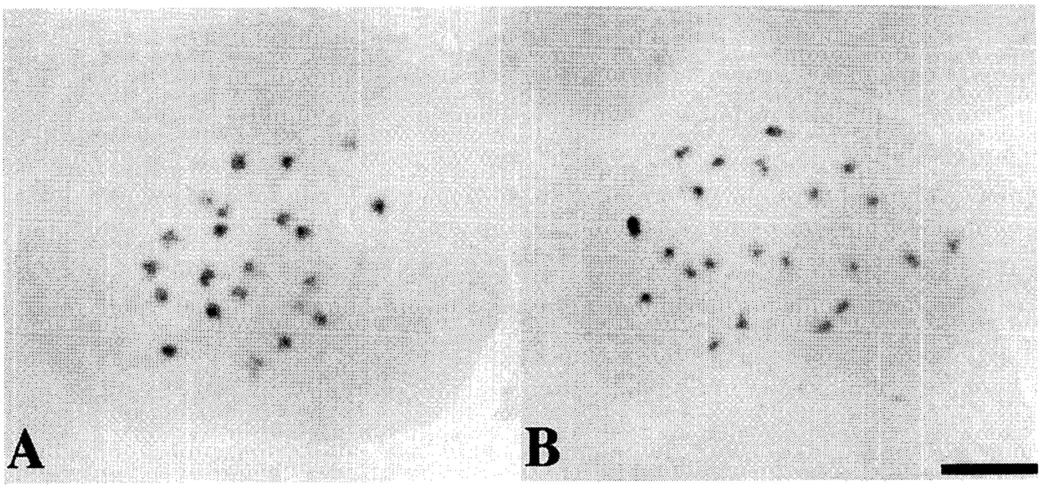

FIG. 4. Microphotographs of somatic chromosomes at metaphase of *Vincetoxicum. izuense* (A) and *V. hoyoense* (B). Scale bar represents 4μm.

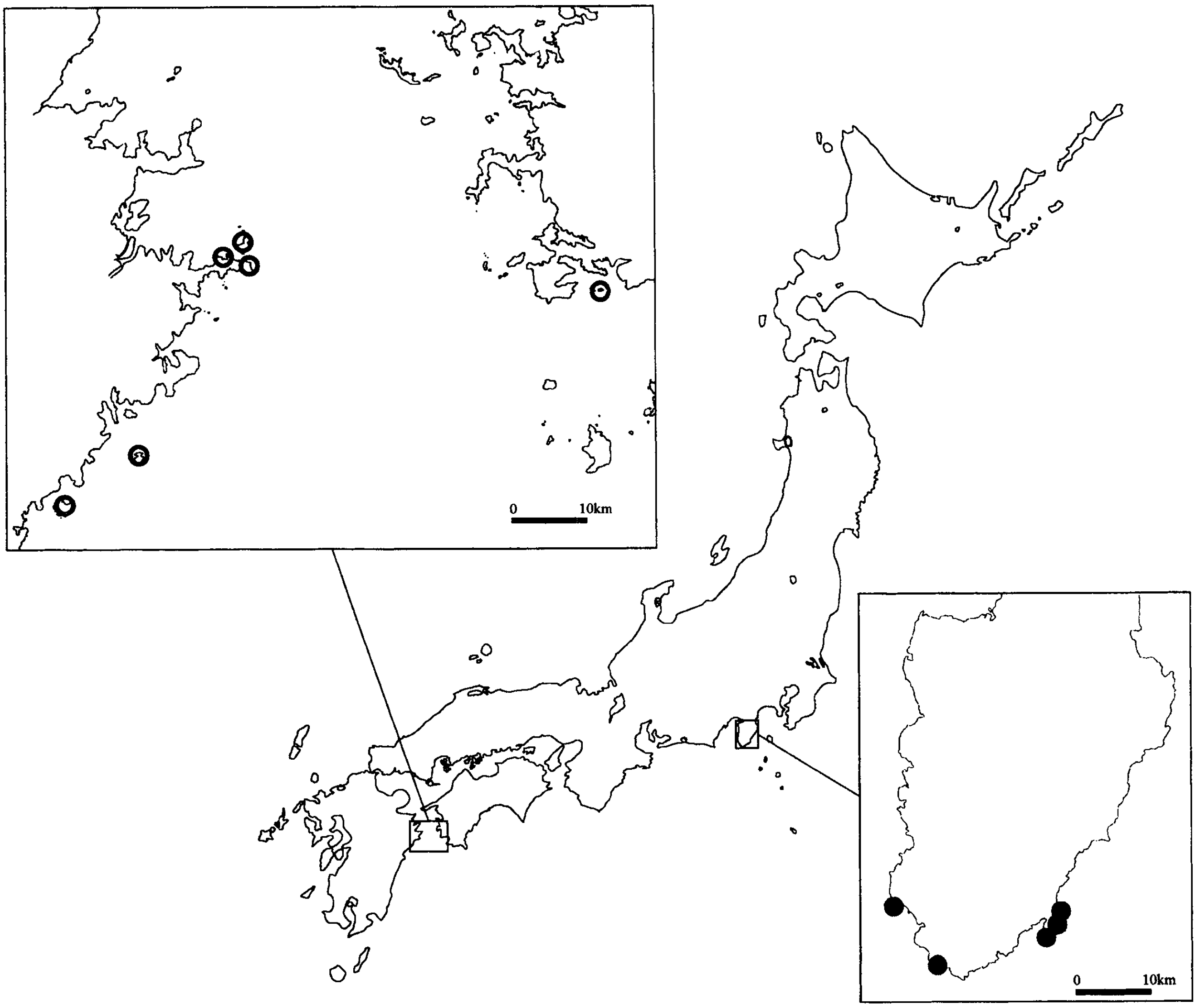

FIG. 5. Distribution map of *Vincetoxicum izuense* and *V. hoyoense.* Solid circles indicate distribution of *V. izuense;* open circles indicate distribution of *V. hoyoense.*

base rounded or truncate, apex acuminate or acute. Inflorescences axillary, 1-3 per axil, umbellately cymose, flowers 8-20, 4-8 flowers open at a time; peduncle 1.5-6 cm long, 1-2 branched, pubescent in one line; pedicels slender, 8.5-15 mm long, pubescent on one side or densely covered with short trichomes, purplish or greenish. Flowers dark purplish or rarely pale greenish yellow; calyx rotate, purplish or greenish, deeply 5-lobed, lobes narrowly ovate, ca. 2 mm long, 1 mm wide, apex acute, abaxial surface with dense curved trichomes; corolla rotate, deeply five-lobed, 18-20 mm across, lobes lanceolate, 7-9.5 mm long, 2.5-3 mm wide, apex retuse, both surfaces glabrous; corona 1/2 as long as gynostegium, deeply 5-lobed, lobes fleshy, triangular, ca. 1mm long, 1mm wide, adnate to abaxial surface of stamen, glabrous; stamens 2 mm long, 0.7 mm wide; anther wings ca. 0.5 mm long; connective appendages 0.7 mm long, 0.7 mm wide, broadly ovate. Pollinarium: corpuscula narrowly ellipsoid, brownish, 0.26 mm long, 0.14 mm wide; caudicula filiform, 0.2 mm long; pollinia ellipsoid, 0.3 mm long, 0.12 mm wide, subapically attached to caudicles. Follicles fusiform, 5.5-7 cm long, 0.9-1.4 cm wide, glabrous. Seeds blackish brown, black speckled, flat, ovate, 7.5-8.6 mm long, 4-5.7 mm wide, coma 16.5-18.2 mm long. Chromosome number $2n=22$ (Fig. 4B).

Japanese name: Hoyo-kamomezuru (nov.)

Vincetoxicum hoyoense is a large, perennial, twining herb on rocks and on the margin of thickets facing the sea. Its distribution is around the Bungo Channel and it is endemic to small islands and peninsulas of Ehime, Oita and Miyazaki prefectures (Fig. 5).

Vincetoxicum hoyoense resembles *V. japonicum* f. *puncticulatum,* with which it might be misidentified, but it can be distinguished from *V. japonicum* by it twining stems and larger (over 10 cm long) leaf blades with shallowly cordate base. While the corolla lobes of *V. hoyoense* are 7-9.5 mm long and lanceolate, those of *V. japonicum* are 4-7 mm long and ovate or oblong. Although the floral characters are more similar to *V. sublanceolatum* and *V. izuense* than to *V. japonicum, V. hoyoense* can be easily distinguished by the size and shape of the leaves from *V. sublanceolatum* and *V. izuense. Vincetoxicum hoyoense* also resembles *V. izuense* in floral morphology and leaf shape, but it is easily distinguished from the latter by having larger, ovate or elliptic leaves with shallowly cordate base and larger corollas.

Other specimens examined: JAPAN. **Shikoku.** Ehime Pref.: Minamiuwa-gun, Jyohen-cho, Ategi Isl.: 14 Jun. 1923, *M. Ogata s. n.* (KYO); 17 Jul. 1942, S. *Sugaya s. n.* (TUS); *T. Yamashiro & A. Yamashiro 7445* (TUS). **Kyushu.** Oita Pref.: Minamiamabe-gun, Kamae-cho, Mishima Isl., 24 Jul. 1921, *Z. Tashiro s. n.* (KYO); 21 Oct. 1984, *M. Arakane s. n.* (KAG); Tsurumi-cho, Tsurumi Cape, *Z. Tashiro s. n.* (KYO); Tanga, 7 Nov. 2001, *T. Yamashiro & A. Yamashiro 7798* (TUS); Kajiyoseura, 3 Aug. 2000, *T. Yamashiro & A. Yamashiro 7230* (TUS), Ohshima Isl., 8 Jun. 2001 *T. Yamashiro & A. Yamashiro 7450* (TUS). -Miyazaki Pref.: Higashisuki-gun, Kitaura-cho, Shimaura-jima, 3 Aug. 1936, *Y. Samejima s. n.* (KYO).

We thank Dr. H. Ohashi for useful comments, and the curators of the herbaria of Kyoto University (KYO), the University of Tokyo (TI), the National Science Museum (TNS), and Kagoshima University (KAG) for permission to examine specimens. Thanks are also due to Ms. A. Yamashiro for collecting materials and to Mr. K. Sato for cultivating the living plants.

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Received January 4, 2004; accepted January 31, 2004